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IN THE UNITED STATES PATENTS AND TRADEMARK OFFICE

K-1926

Applicant : Migaku Suzuki et al.

Title : HIGHLY WATER ABSORBENT SHEET

Serial No. : 09/667,815

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Group Art Unit : 1771

Examiner : John J. Guarriello

Hon. Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

September 25, 2003

APPEAL BRIEF

Sir:

Further to the Notice of Appeal filed on July 31, 2003, an appeal brief has been filed herewith in triplicate. A check in the amount of $160.00 is attached for the appeal brief fee.

REAL PARTY IN INTEREST

The applicant is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There is no related appeal and interferences.

STATUS OF CLAIMS

Claims 1-5, 7-9, 13-15 were rejected finally. Claims 1-5, 7-9 and 13-15 are pending in the application and are at issue. Claims 6, 10-12 and 16-23 were cancelled.

STATUS OF THE AMENDMENT

After final Action, an amendment was filed together with Notice of Appeal, wherein the title of the invention has been changed, and claims 10 and 11 as non-elected invention have been cancelled. It is believed that the amendment will be entered.

SUMMARY OF THE INVENTION

The present invention relates to a highly water absorbing composite sheet suitable for various absorbent products, such as diapers for infants and adults, sanitary napkins, blood absorbent and so on.

The conventional highly water absorbing composite sheet comprises a non-woven substrate sheet and solid SAP (Super Absorbent Polymer or highly water absorbing resin) held on the surface of the non-woven substrate sheet. The SAP has been adhered to the substrate by a hot melt adhesive, or a suspension of the solid SAP or a suspension of the solid SAP and pulp has been coated on the substrate. The suspension may contain easy-to-thermally-melt binder fibers. Also, the easy-to-thermally-melt fibers are mixed with SAP, and the mixture is fixed to the substrate.

In the mixture of the SAP and pulp, a sufficient amount of the SAP can not be affixed to the substrate. In case of using the binder, if an amount of the binder is increased, swelling capacity of the solid SAP is deteriorated, and if the amount of the binder is reduced, the solid SAP can not be sufficiently adhered to the substrate (page 1, line 17 to page 2, line 17).

In view of the conventional problems, the present invention has been made, wherein the solid SAP and substrate are loosely bonded with each other so that the SAP and substrate can absorb liquid to swell sufficiently while the swollen SAP does not separate from the substrate.

In claim 1 of the invention, a highly absorbent composite sheet comprises a non-woven fabric substrate having a bulky structure, solid SAP partly contained inside the bulky structure

and partly disposed on a surface of the non-woven substrate, and a hot-melt adhesive as a thermally fusible component. The hot-melt adhesive forms a fibrous network in a form of a mesh, and the fibrous network contacts and covers the solid SAP so that the solid SAP is held in position.

Namely, in the invention, as shown in Figs. 1 and 2, the substrate (1) and the solid SAP (2) are used, as in the conventional structure. However, in the invention, the hot-melt adhesive is used to form a fibrous network (3) in the form of a mesh to cover the solid SAP on the substrate. The fibrous network by the hot-melt adhesive does not substantially enclose the particles of the solid SAP, so that the absorption of the solid SAP and the substrate is not affected or deteriorated. Therefore, the network by the hot-melt adhesive can properly hold the solid SAP on the substrate and does not provide the adverse affect for the absorption of the solid SAP and the substrate. The above and other advantages of the invention are explained on page 17, lines 15-28 of the specification.

In claim 7, a highly absorbent composite includes a composite absorbent and a sheet material. The composite absorbent includes a non-woven substrate, an SAP layer, and a hot-melt adhesive layer forming a fibrous network in a form of a mesh and substantially entirely covering the SAP layer. The sheet material is disposed on the adhesive layer and bonded with the composite absorbent by the hot-melt adhesive layer by an adhesive property thereof.

The structure in claim 7 is explained in Fig. 16 and page 23, line 34 to page 24, line 17 of the specification.

In claim 8, a highly absorbent composite comprises first and second composite absorbents. Each composite absorbent comprises a non-woven substrate, an SAP layer, and a hot-melt adhesive layer forming a fibrous network in a form of a mesh and covering the SAP layer. The first composite absorbent is laid on the second composite absorbent such that the hot-melt adhesive layers contact

to each other and are bonded together by an adhesive property thereof to form a two material composite structure.

The structure in claim 8 is explained in Fig. 17 and page 24, lines 18-33 of the specification.

In claim 13, a highly absorbent composite sheet comprises a non-woven substrate including a non-woven fabric with voids therein, solid SAP partly disposed in the voids and distributed almost all over in layers on a surface of the non-woven fabric, and a dual fibrous network covering a surface of the solid SAP. The dual fibrous network includes a first fibrous network in a form of dense mesh comprising a hot-melt adhesive and a second fibrous network in a form of looser mesh positioned over the first fibrous network.

The dense and loose meshes by the networks are explained on page 19, line 5 to page 21, line 12. As explained in the specification, in order to prevent SAP particles from peeling from the substrate in a dry condition, it is preferable to have a structure of fine mesh fibrous network. On the other hand, in order to prevent swollen SAP particles from peeling in a wet condition, it is preferable to have coarse fibrous network. In claim 13 of the invention, the dense mesh fibrous network and looser mesh fibrous network are formed, so that the contradict requirements are satisfied to properly hold the SAP particles in dry and wet conditions.

ISSUE

Whether claims 1-5, 7-9, and 13-15 are unpatentable over WO 98/25999 in view of EP 826349.

GROUPING OF CLAIMS

Claims 1-5 and 7-9 fall together, wherein claim 1 represents the group.

Claims 13-15 fall together, wherein claim 13 represent the group.

ARGEMENT

(1) whether claims 1-5 and 7-9 are unpatentable over WO 98/25999 in view of EP 826349

WO '999 (EP '549) is directed to highly absorbent composite compositions, which were invented by the present inventors together with another inventor. An absorbent sheet in WO '999 basically includes hydratable fine fibers in the form of microfibril obtained from cellulose or a derivative thereof (HFFM), absorbent polymer particles (SAP) bonded together by the HFFM, and a sheet supporting a absorbent layer including the SAP and HFFM.

As shown in Figs. 8(a) and 8(b) and explained in paragraph 0121 of the specification, each SAP particle 12 is completely covered by the HFFM 11 and the SAP particles are taken in a network structure of the HFFM 11 as the adjoining particles are entwined with each other by the HFFM. In forming the absorbent sheet, the network structure wherein the HFFM and the SAP are dispersed in a dispersion medium is formed, and is applied onto the supporting sheet. The network structure may be directly applied to the supporting sheet and dried.

Therefore, as clearly shown in Figs. 8(a) and 8(b) and other figures of WO '999, each SAP particle is covered with the fine fibers, but such SAP particles constituting the absorbing layer is not covered with any other material.

In claim 1 of the invention, the non-woven fabric substrate and solid SAP, which are disclosed in WO '999, are used. However in the invention, the hot-melt adhesive is applied in the form of mesh to fix the solid SAP on the substrate. Accordingly, the solid SAP can be securely retained or affixed on the substrate while keeping the ability of absorbing liquid through the hot-melt adhesive in the form of mesh. In WO '999, a hot-melt adhesive in the form of mesh is not used though the fine fibers in the form of microfibril, i.e. HFFM, are coated to combine the SAP particles to attach the SAP particles onto the supporting sheet. Although the

HFFM is coated on the SAP particles, the fine fibers obtained from cellulose or derivative thereof are entirely different from the hot-melt adhesive in the form of mesh covering the solid SAP.

As stated above, in WO '999, the SAP particles in the three dimensional structure are completely covered by the HFFM. Namely, the SAP particles not facing upwardly or inside the layer of the SAP particles are also covered by the HFFM, so that the SAP particles are relatively firmly bonded together by the entire surfaces of the SAP particles.

On the other hand, in the invention, the particles of the solid SAP are only covered by the fibrous network in the form of mesh formed of hot-melt adhesive. Namely, the particles of the solid SAP not directly contacting the fibrous network or the particles of the solid SAP away from the surface are not covered by the hot-melt adhesive, so that the particles of the solid SAP not adhered by the fibrous network can freely move and absorb liquid without prevention.

Therefore, in the invention, when liquid is applied to the absorbent composite, the liquid can pass the fibrous network and the particles can absorb the liquid through the portions not covered by the fibrous network by the hot-melt adhesive. As the particles of the solid SAP swell, the particles of the solid SAP can become large in its size freely by only pushing up the fibrous network. In WO '999, since the SAP particles are completely covered by the HFFM, liquid applied to the composite composition must penetrate the HFFM, and in order to absorb the liquid by the SAP particles, the HFFM on the SAP particles must be broken or destroyed by swelling the liquid. Therefore, the composite in WO '999 can not absorb the liquid freely in a natural state.

Accordingly, the absorbent composite sheet in claim 1 of the invention is superior to that of WO '999 in the absorbing speed and capacity. The features in claim 1 of the invention are not disclosed or suggested in WO '999.

In EP '349, an absorbent article includes an inner sheet, one outer sheet of fine interstice, and the other outer sheet with fluid permeability. The one outer sheet adheres to the face on the opening side of the recesses on the inner sheet, while the other outer sheet adheres to the face on the opposite side of the inner sheet. Namely, the inner sheet 2 is sandwiched between the one outer sheet 1 and the other outer sheet 3 in a condition that SAP 4 is held in the recesses 2a of the inner sheet 2 by means of an adhesive.

In claim 1 of the invention, the hot-melt adhesive is applied in the form of mesh to cover and fix the solid SAP. In EP '349, the adhesive is used to join the sheets, but EP '349 does not disclose or suggest that the adhesive is applied in the form of mesh. Thus, the features of claim 1 of the invention are not disclosed or suggested in EP '349.

In the invention, the hot-melt adhesive in the form of mesh is applied to cover or overlay the SAP to securely fix the SAP on the non-woven substrate, while permitting the moisture or liquid to pass therethrough. The features of claim 1 of the invention are not disclosed or suggested in the cited references. Especially, the hot-melt adhesive in the form of mesh is not suggested in the cited references. Even if the cited references are combined, claim 1 of the invention is not obvious from the cited references.

(2) whether claims 13-15 are unpatentable over WO 98/25999 in view of EP 826349

In claim 13, a highly absorbent composite sheet comprises a non-woven substrate including a non-woven fabric with voids therein, solid SAP partly disposed in the voids and distributed almost all over in layers on a surface of the non-woven fabric, and a dual fibrous network covering a surface of the solid SAP. The dual fibrous network has a first fibrous network in a form of dense mesh comprising a hot-melt adhesive and a second fibrous network in a form of looser mesh positioned over the first fibrous network.

The dual fibrous network formed of the dense mesh and loose mesh in claim 13 is different from the single fibrous network in claim 1. Also, as explained before, in order to prevent SAP particles from peeling from the substrate in the dry and wet conditions, the ideal requirements of the mesh fibrous network are different. In claim 13 of the invention, the dense mesh fibrous network and loose mesh fibrous network are formed, so that the contradict requirements in the dry and wet conditions are satisfied. In view of the advantages and the difference in the structure, claim 13 is distinct in patentability from claim 1 and should be examined separately.

As explained in the previous section, in WO '999, the SAP particles are coated with the HFFM. The HFFM does not constitute the network structure. Even if the HFFM is considered to form a network structure, since the HFFM completely covers the SAP particles, the dense and loose meshes different in the covering condition can not be formed. Thus, WO '999 does not disclose or suggest the dense and loose meshes in claim 13.

In EP '549, also, the inner sheet 2 with SAP 4 is sandwiched between the one outer sheet 1 and the other outer sheet 3 by the adhesive. The adhesive does not suggest the dense and loose meshes in claim 13.

Therefore, the features in claim 13 are not disclosed or suggested in the cited references. Since the dense and loose meshes are not disclosed in the cited references, even if the cited references are combined, claim 13 is not obvious from the cited references.

CONCLUSION

As explained above, even the cited references are combined, claims 1 and 13 of the present invention are not obvious from the cited references.

It is respectfully requested that the rejections are reversed and the claims are allowed.

Respectfully Submitted,

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CLAIMS

1. Highly absorbent composite sheet comprising:

a non-woven fabric substrate having a bulky structure;

solid SAP partly contained inside said bulky structure and partly disposed on a surface of said non-woven substrate; and

a hot-melt adhesive as a thermally fusible component, said hot-melt adhesive forming a fibrous network in a form of a mesh, said fibrous network contacting and covering said solid SAP so that said solid SAP is held in position.

2. The highly absorbent composite sheet of claim 1, further comprising fine cellulose disposed on the solid SAP as a layer, said fine cellulose being covered by the fibrous network.

3. The highly absorbent composite sheet of claim 1, wherein a coated amount of said hot-melt adhesive is 0.2 to 10 g / $m^2$.

4. The highly absorbent composite sheet of claim 1, wherein said hot-melt adhesive is mainly composed of ethylene-vinyl acetate copolymer and non-tacking.

5. The highly absorbent composite sheet of claim 4, wherein a content of vinyl acetate in ethylene-vinyl acetate which is a main composition of said hot-melt adhesive is 20 to 40 % by weight and a thermal fluidity rate of said hot-melt adhesive is 50 to 150 g / 10 minutes.

7. A highly absorbent composite comprising:

a composite absorbent including a non-woven substrate, a SAP layer, and a hot-melt adhesive layer forming a fibrous network in a form of a mesh and substantially entirely covering said SAP layer, and

a sheet material disposed on said adhesive layer and bonded with said composite absorbent by said hot-melt adhesive layer by an adhesive property thereof to form a composite structure.

8. A highly absorbent composite comprising:

first and second composite absorbents, each comprising a non-woven substrate, an SAP layer, and a hot-melt adhesive layer forming a fibrous network in a form of a mesh and covering said SAP layer, said first composite absorbent being laid on the second composite absorbent such that said hot-melt adhesive layers contact to each other and are bonded together by an adhesive property thereof to form a two material composite structure.

9. The highly absorbent composite of claim 8, further comprising an additional sheet material interposed between said first and second composite absorbents and bonded thereto by an adhesive property of said hot-melt layers of said first and second composite absorbents to form a three material composite structure.

13. A highly absorbent composite sheet comprising:

a non-woven substrate including a non-woven fabric with voids therein,

solid SAP partly disposed in the voids and distributed almost all over in layers on a surface of the non-woven fabric, and

a dual fibrous network covering a surface of the solid SAP, said dual fibrous network having a first fibrous network in a form of dense mesh comprising a hot-melt adhesive and a second fibrous network in a form of looser mesh positioned over said first fibrous network.

14. The highly absorbent composite sheet of claim 13, wherein said dual fibrous network substantially entirely covers the solid SAP to thereby prevent the solid SAP from coming off.

15. The highly absorbent composite sheet of claim 13, wherein the fibers of said hot-melt layer of dense mesh are finer than the fibers of said hot-melt layer of loose mesh.